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CONTENTS

Discoveries and Current Events. — Rumania: Phytopathological Events during the Year 1941, p. 17.

Various Questions. — The Mineral Intake and the Resistance of Plants to Microbial Diseases, p. 20.

Legislative and Administrative Measures. — Germany, p. 23. – Germany (Alsace), p. 23. – Germany (Protectorate of Bohemia and Moravia), p. 23. – Germany (Prussia), p. 23. – Morocco (French Zone of), p. 23. – Switzerland, p. 23.

Recent Bibliography, p. 25.

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INTERNATIONAL BULLETIN
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1942 No. 2

DISCOVERIES AND CURRENT EVENTS *

RUMANIA.

Phytopathological Events during the Year 1941 †

The year 1941 was very propitious for the appearance and development of different diseases of cultivated plants.

Mention will be limited here to some new diseases and to those which presented certain marked peculiarities during the course of the year.

Beet Rust.

The most frequently occurring diseases of the sugarbeet in Rumania are leaf spot (*Cercospora beticola* Sacc.), mosaic disease (caused by an ultravirus), dry and heart rot and crown gall (*Bacterium tumefaciens* Smith et Town.).

On September 3, 1941, beet rust caused by *Uromyces betae* (Pers.) Kühn made its appearance for the first time on crops at Cenad, Department of Timis Torontal, Banat. These crops were badly damaged, attack being particularly severe on lots which had been given chemical fertilizers (N, P and K). The most susceptible variety was that bred at the Cenad Experiment Station: ' Cesena C '.

Bitter pit of Pears.

A fairly widespread disease and which causes serious damage to apples is bitter pit (' Stippenkrankheit ') which was observed and described for the first time in Rumania in 1934.

This disease is not reported so frequently on pears, but it is known in Australia where it causes heavy damage, in South Africa, in the United States and in England.

* Under this and the third heading the countries are arranged in French alphabetical order.

† Communication from the official correspondent of the Institute, Mr TRAIAN SĂVULESCU, Professor at the Faculty of Agronomy, Chief of the Phytopathological Section at the Institute for Agricultural Research of Rumania, Bucharest, Rumania.

This disorder was again found in Rumania this autumn on pears in an orchard in the environs of Bucharest, on the variety ' Président Drouard '. The disease made its appearance before ripening of the fruit and the diseased pears were deformed, presenting an irregular up and down surface. The affected fruits had a shrivelled appearance. In the sunken parts of the surface, the tegument maintains a green colour contrasting with the rest of the surface which has the yellow colouring of ripe fruit. Brown spots are seen in the inside, like small points, these, however, can be as large as a lentil. The tissue has a spongy aspect, but is hard in consistency, owing to the accumulation of sclereids. The brown spots spread out from the periphery to the carpels enclosing the seeds. The diseased pears have a bitter taste and are not fit for eating. The cause of bitter pit in apples and pears has long been discussed and is still unknown. This disorder has been attributed to: (*a*) different animal or plant parasites (insects, ultravirus, bacteria and fungi); (*b*) various mechanical causes; (*c*) unfavourable soil and climatic conditions.

Today, it is known that this physiological disease is due to a hydric disequilibrium. There are many theories which endeavour to explain how this disequilibrium makes the manifestation of the disease possible. One of these theories sustains that an abundant transpiration stimulated by an abundant absorption of water from the soil results in an increased concentration of the cellular sap, especially in acids, which destroy certain groups of cells, where the brown spots appear. According to another theory, it is considered that pronounced drought prevents the absorption of water from the soil and the indispensable mineral salts. The destruction of the cells in the diseased parts would be due to the deficiency in nutrient salts. Finally, the appearance of bitter pit is explained by the sudden check of transpiration during the night, without the absorption of water by the roots being stopped. In this way, a heavy pressure occurs in the cells of the fruit which burst and perish. The latest theory is based on the observation that the dead cells have a very high starch content. When the starch is changed into soluble sugars, if the quantity of water suddenly increases in the fruit, the cells which contain much sugar have an excessive osmotic pressure and exert pressure on the cells in which the starch has not yet been transformed, and cause the breaking of the cell walls. The cells die, become brown and retain their starch. This theory cannot be accepted as an explanation of bitter pit of pears, as no starch is found in the brown cells in pears. These theories are not based on complete observations and their value, for the moment, remains hypothetical.

Experiments undertaken in the United States prove that abundant irrigation of the trees during growth promote the appearance of the disease; a medium irrigation during the course of vegetation, followed by an abundant irrigation towards the end of vegetation, appreciably favour the appearance of the disease. A moderate irrigation throughout the vegetative period and especially towards the end of the vegetative period maintains the best hydric equilibrium of the trees and prevents the disease occurring.

From what is known up to date on bitter pit, what is certain is that, to a large extent, rational irrigation prevents the appearance of the disease. With

a suitable cultivation technique, the absorption and utilization of water can be regulated and the necessary hydric equilibrium maintained. It is recommended that the orchards should not be too closely planted, that each tree be pruned equally, that the fruits should not be harvested too late in the season and, that susceptible varieties should be replaced by resistant varieties.

Wilt of the Lupin.

Among the legumes which are beginning to have a special importance in Rumanian agriculture are the soybean and the lupin. Some years ago, chiefly the white lupin (*Lupinus albus*) was cultivated. This has gradually been replaced by varieties of the blue lupin (*L. augustifolius*) and the yellow lupin (*L. luteus*) bred in Germany. From the time of their importation (1937-1938), these varieties were attacked by the disease very widespread in Germany called wilt disease (' Welkekrankheit '). The entire plant wilts, the leaves lose their turgidity and drop off the stem. Finally the diseased plants dry up and die off. Wilting begins in the young parts of the plant and continues towards the base. At first the leaves lose their chlorophyll and subsequently, in browning, dry up completely and fall to the ground. Of the diseased plant only the dried stem remains and this can easily be uprooted. Sometimes the disease develops on delimited and isolated areas, but often it covers the whole field. It has been found that the blue lupin is more susceptible than the yellow lupin which again is more susceptible than the white lupin. There is no doubt that this wilting disease was introduced from Germany through the selected seed having spores of the parasite on the seed surface. The disease has been found to be very serious, especially during the crop year 1940-41, being favoured by the very abundant rains.

From the diseased tissues only *Fusarium oxysporum* Schlecht. has been isolated and made into cultures, that is, the same pathogenic agent recognized in Germany as being the cause of the disease. As a means of preventing extension of the disease, the cultivation of other crops on land as yet not infected and the dusting of seed with organic mercury compounds (' Germisan ', ' Ceresan ', ' Abavit ') are recommended.

Rust of *Carthamus tinctorius*.

The cultivation of this oil-yielding plant began to develop from one year to another in our country. A severe attack of *Puccinia carthami* (Hutzelm.) Cda. was reported on crops in the Bucharest region during the month of July, 1941. The fungus was limited solely to the leaves and presented only uredospores and teleutospores.

(*to be continued*).

VARIOUS QUESTIONS

The Mineral Intake and the Resistance of Plants to Microbial Diseases *

The farmer knows that a wet and cold spring and summer do not fill his granary; persistant bad weather, in fact, reduces the activity of the plant and promotes the development and spread of cryptogamic diseases. Consequently it is the sun which drives away the plant parasites at the same time assuring the high yields wanted in crops.

It is still the common opinion of the farmer that the intensity of cryptogamic diseases varies according to the fertility of the soil; thus natural or acquired fertility has also a part to play; that is to say, a plant which can obtain all the necessary elements for its development has a higher resistance to microbial infections than a plant exposed to some mineral deficiency.

The farmer can do nothing against a shortage of sunlight; he can do much towards the vigorousness of vegetation, all his art consisting in maintaining the fertility of the soil. He could easily perform his task if he knew the requirements of the different crops, but these fundamental data are wanting on many points. To attempt to acquire them, it was necessary to await the Pasteurian discoveries as they have contributed the means of making cultures in mediums free from microbes and, consequently, to realize for the higher plants that which Raulin did for *Aspergillus niger*: establish the composition of a nutrient solution which enables the plant to complete its life cycle as well, if not better, as in highly fertile soils. This is the problem which I have resolved using maize as the experiment plant.

It is a matter here of showing what the question is and subsequently considering its relation with the natural resistance of the plant to microbial diseases.

Investigation on the mineral elements necessary for the development of maize.

I began this study in 1899; as a preliminary step it was advisable to compare first the nutritive value of nitric nitrogen and ammoniacal nitrogen; it was thought, at that time, that ammonical nitrogen could not be utilized directly by the plant; its preliminary transformation into nitric nitrogen was considered to be necessary.

Experience has shown that ammonical is equal to nitric nitrogen; their yield in vegetal matter is the same for the same weights of nitrogen used; to establish this essential fact, however, the use of aseptic nutrient solutions was necessary.

* Note of Prof. PIERRE MAZÉ, Pasteur Institute, Paris, France.

The solution I employed at this time had the following composition:—

Sodium nitrate	1
Ammonium sulphate	equivalent quantity
Monopotassium phosphate	1
Magnesium sulphate + 7 H_2O	0.2
Ferrous sulphate + 7 H_2O	0.1
Manganese chloride + 4 H_2O	0.1
Zinc chloride	traces
Potassium silicate	»
Calcium carbonate	2
Distilled water	1000

All these mineral elements exist in the ash of the maize plant where they had already been discovered by analysis; there are others which were not known, but which the salts and the water employed had contributed as impurities and which it was necessary to ascertain. Such as it is, this first result showed that it is a matter of indifference as to whether ammoniacal salts or nitrates are used in solving the problem in question.

The solution of the problem was reported in 1919; those whom these researches interest will find full details in the *Annales de l'Institut Pasteur*, 1899 to 1919.

The nutrient solution which assures the growth of maize in a medium free from microbes, just as well as in the best soils, has the following composition:

Ammonium nitrate	0.235
Monopotassium phosphate	0.5
Magnesium sulphate + 7 H_2O	0.1
Ferrous sulphate + 7 H_2O	0.05
Manganese sulphate + 4 H_2O	0.02
Zinc chloride	0.02
Sodium silicate	0.01
Aluminium sulphate	0.01
Sodium borate	0.005
Sodium fluoride	0.002
Potassium iodide	0.002
Calcium carbonate	2
Distilled water	1000

The properties of this solution vary according to the chemical state of the elements which compose it; the nitrates of ammonium, potassium and calcium are the best nitrogenous nutrients as they are completely assimilable. It is important that all the components of the solution be used integrally by the plant; the sodium of sodium nitrate, the sulphuric and hydrochloric acids of the sulphate and chloride of ammonium which are not assimilable to the same extent as the nitric acid or ammonia of these salts influence the pH of the nutrient solution and on the other hand check the growth of the plant by accumulating in the tissues.

Provided with these data I was able to study methodically the problems relative to the nutrition of maize.

Three series of results were obtained from this study.

The first established the law of physiological relations: the plant takes from the nutrient solution the elements which it needs in the proportions determined to constitute the raw sap. The ideal solution therefore, is that which combines the physiological proportions of the ascending sap. It is recognized

that a solution fills these conditions when the plant absorbs it without leaving any residuum; if the solution is too concentrated, the roots absorb proportionally more water than salts, the solution condenses and vegetation stops; if the solution is too weak, the roots take proportionally more salts than water, the solution soon loses its strength and vegetation stops owing to the excess of exhausted liquid.

A direct consequence of this law is the existence of a constant relation between the volume of physiological solution used for each species and the weight of the plant matter developed, the external conditions being the same.

Another interesting consequence is the faculty of the roots to select the nutrient salts. This faculty comprises the possibility of an ionic absorption generally admitted moreover; however, this mode of absorption cannot be brought forward in a conclusive manner with the use of a sole solution, but the utilisation of pots with two independent capacities enabled me to decide the question and show that the nitric nitrogen and ammoniacal nitrogen of the ammonium nitrate dissolved in distilled water, are absorbed preferably one by one according to the nature of the nitrogenous compound in the complete solution which feeds the plant.

The ionic absorption as well as the molecular absorption, on the other hand, explain that a plant absorbs, according to the nature of the soil, the elements which characterize these soils, indifferent or even noxious.

Therefore, the nutritive value of all the mineral elements found in the ash of a plant cannot be decided through analysis; direct experimentation is the sole means of settling this point.

Influence of the mineral elements in a complete solution on the growth of maize.

The second series of results comprised the respective effects of the elements in the nutrient solution on the growth of maize.

If the solution is deprived of one of the following substances, N, P, K, Ca, Mg, which are utilized in relatively high quantities, the seedling does not develop.

If, on the contrary, it is one of the elements that the seedling only utilizes in minimum doses which is wanting, the few milligrams or fractions of a milligram contributed by the seed assure a good start in growth; the plant develops normally for several days, sometimes several weeks, then growth slows down, while at the same time other deficiency symptoms appear; these symptoms consist in complete decoloration of the leaves (iron and sulphur deficiency) or in a less marked chlorosis (Mn, Zn, Bo, etc.) accompanied one or the other by a considerable reduction in the aerial parts, and leading to a more or less rapid dying-off.

It is in ascertaining the means of remedying these mishaps that the role of the sun was shown under an unsuspected aspect.

Only the essential part which it plays in the resistance of the plant to chemical intoxications and microbial infections will be considered here.

The study of the effects of mineral deficiencies on the plant will enable us to define it.

(*to be continued*).

LEGISLATIVE AND ADMINISTRATIVE MEASURES

Germany. — By Ministerial Provision of November 7, 1941, based on the Decrees of March 28, 1929 and September 30, 1932 [see this *Bulletin*, 1929, No. 6, p. 83 and 1932, No. 12, p. 205] with a view to preventing the introduction of the carnation leaf roller [*Tortrix pronubana*], the importation of carnations (cut flowers) from Italy, Denmark and the Netherlands is authorized from November 15, 1941. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Dezember 1941, 21. Jahrg., Nr. 12, S. 88).

Germany (**Alsace**). — A Decree dated October 29, 1941 introduces into Alsace the measures relative to the control of fruit crop diseases and pests, similar to those laid down for the Reich by Decree of October 29, 1937 [see this *Bulletin*, 1938, No. 5, pp. 100-101]. (*Nachrichtenblatt für den Deutschen Pflanzenschutzdienst*, Berlin, Anfang Dezember 1941, 21. Jahrg., Nr. 12, S. 88).

Germany (**Protectorate of Bohemia and Moravia**). — The Ministerial Notification No. 828 dated October 7, 1941 publishes the list of preparations which are exempt from the provisions of December 5, 1940 [see this *Bulletin*, 1941, Nos. 7 & 8, p. 142] relative to the supervision of and trade in products intended for use in plant protection. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Dezember 1941, Bd. XIII, Nr. 8, S. 284-285).

Germany (**Prussia**). — A Decree dated October 30, 1941 renders the clearing of thistles in the Stade district compulsory.

The thistles (*Cirsium arvense*) should be cut or uprooted so that none may attain maturity. The necessary operations should be concluded before July 1. In fields grown to cereals, however, the control of thistles will have to be undertaken fairly early in order to avoid damaging the crops to any extent through control operations. Control operations will be supervised by the police authorities and the Plant Protection Service. This latter may, in agreement with the mayors of the communes in question, engage persons duly authorized to inspect all fields and to denounce any eventual recalcitrants. (*Amtliche Pflanzenschutzbestimmungen*, Berlin, 1. Dezember 1941, Bd. XIII, Nr. 8, S. 282).

Morocco (**French Zone of**). — An Order of December 5, 1941, authorizes the destruction of rabbits causing damage to crops and plantations in the Rabat region. (*Bulletin Officiel*, Rabat, 26 décembre 1941, XXX^e^ année, n° 1522, p. 1195).

Switzerland. — By Ordinance No. 1 of the War Office for Industry and Labour and the War Office for Nutrition, dated November 25, 1941, the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour is authorized to decree measures on production, stocks and the system of compulsory delivery of copper salts and copper preparations intended for use in plant protection.

This Section, in particular, will be in a position to lay down a program of production and demand its execution by the producers.

The Section of Chemical and Pharmaceutical Products, in agreement with the Section for Metals of the War Office for Industry and Labour, will establish the quantities of copper to be allotted for the production of copper salts and copper preparations intended for use in plant protection.

The distribution and utilization of copper salts and copper preparations intended for use in plant protection will be regulated by the Section of Chemical and Pharmaceutical Products in so far as regards the requirements of industry, handicrafts and the army, and by the Section of Fertilizers and Utilization of Waste Products of the War Office for Nutrition, as regards agricultural requirements.

In particular, these two Sections will have the power: (*a*) to ration, to contingent or subordinate to a preliminary authorization the delivery and purchase; (*b*) to prohibit, for certain uses, the utilization of copper salts and copper preparations intended for plant protection; to prescribe the use of substitute products and to take, as regards consumption, any other measure which may be found necessary to assure an economic utilization of copper salts and copper preparations intended for use in plant protection.

The Section of Chemical and Pharmaceutical Products and the Section of Fertilizers and Utilization of Waste Products are authorized to prescribe the necessary control measures, to carry out enquiries and oblige persons and enterprises engaged in production, elaboration and trade, as well as the holders of stocks and consumers, to keep registers and also to report periodically.

Each is required to give all information on the matter to the Services charged with the supervision of the products, and, if necessary, to produce justificatory documents.

The agents for inspection may enter into workshops, stores and other localities of enterprises and have access to all documents found therein and, as the case may be, ascertain the arrangement. They may also interrogate any person with a view to obtaining information.

In the case of necessity, the cantons are required to lend the assistance of the police.

When a person or enterprise contravenes this Ordinance, the measures to be carried out or the decisions of the case in point, or when he or it, by his or its behaviour, necessitates inspection operations, the costs of these operations will be charged to the said person or enterprise.

Whosoever infringes this Ordinance or the measures to be executed is liable to a penalty of 30,000 francs (maximum) or imprisonment for twelve months (maximum).

The two penalties may be cumulative. Negligence is also punishable.

According to Article 4 of the Decree of the Federal Council dated June 25, 1941 aiming at assuring the supplying of the population and the army in raw materials for industry and in semi-manufactured or manufactured products, the contravener will be excluded from all participation in the delivery of copper salts and copper preparations intended for use in plant protection and the

permits which were granted him will be withdrawn and, according to the Decree of the Federal Council, dated November 12, 1940, his sales premises and workshops, factories and other enterprises will be closed preventively. (*Recueil des lois fédérales*, Berne, 27 novembre 1941, nº 56, p. 1383-1385).

*** The instructions decreed on the same date by the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour lay down that no one may deliver nor purchase copper salts for the requirements of industry, handicrafts and the army without authorization from the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour.

Renewal of stocks of copper salts for the requirements of industry, handicrafts and the army cannot be effected without authorization, neither from the producer to the merchant, nor between the different branches of trade. Written application for this authorization must be made to the Section of Chemical and Pharmaceutical Products of the War Office for Industry and Labour. (*Ibid.*, p. 1386).

*** The instructions decreed on November 25, 1941 by the Section of Fertilizers and Utilization of Waste Products lay down that no one may deliver or purchase copper salts and copper preparations for use in agriculture without ration vouchers.

The delivery of ration vouchers is regulated by special instructions of the Section.

Mixed powder preparations containing less than 2 per cent. of metal copper, employed for truck crops and in horticulture, may be delivered and purchased without ration vouchers.

The delivery, purchase and use of these powder preparations in wine-growing are prohibited.

The supplying of copper salts and copper products intended for use in agriculture, between the different branches of trade, from the producer to the retailer, is subject to the authorization of the Section. (*Ibid.*, p. 1387-1388).

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